

# MATERIAL SAFETY DATA SHEET

**SRM Supplier:** National Institute of Standards and Technology  
Standard Reference Materials Program  
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Gaithersburg, Maryland 20899

**SRM Number:** 3114  
**MSDS Number:** 3114  
**SRM Name:** Copper Standard Solution  
**Date of Issue:** May 1990  
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## SECTION I. MATERIAL IDENTIFICATION

**Material Name:** Copper Standard Solution

**Description:** SRM 3114 is a single element solution prepared gravimetrically to contain a nominal 10 mg/mL (or 10 mg/g) of copper with a nitric acid volume fraction of 10 %.

**Other Designations:** **Copper in Nitric Acid** (aqua fortis; hydrogen nitrate; azotic acid; engravers acid). **Copper Nitrate\*** (cupric nitrate; copper dinitrate; copper (II) nitrate; nitric acid, copper (2+) salt) in **Spectrometric Standard Solution**.

Name	Chemical Formulas	CAS Registration Numbers
Nitric Acid	HNO <sub>3</sub>	7697-37-2
Copper Nitrate	Cu(NO <sub>3</sub> ) <sub>2</sub>	3251-23-8
Copper	Cu	7440-50-8

**DOT Classification:** Nitric Acid Solution, ID#: UN2031

**Manufacturer/Supplier:** Available from a number of suppliers

\*The addition of copper to nitric acid, along with other intermediate chemical reactions, forms copper nitrate which will precipitate upon evaporation or drying of the solution.

## SECTION II. HAZARDOUS INGREDIENTS

Hazardous Components	Nominal Concentration (%)	Exposure Limits and Toxicity Data
Nitric Acid	10	ACGIH TLV-TWA: 2 mg/kg or 5 mg/m <sup>3</sup>
		OSHA TLV-TWA: 2 mg/m <sup>3</sup> or 5 mg/m <sup>3</sup>
		Human, Oral: LD <sub>50</sub> : 430 mg/kg
Copper Nitrate	3.0	No TLV-TWA established for copper compounds.
		Rat, Oral: LD <sub>50</sub> : 794 mg/kg
Copper	1	ACGIH TLV-TWA (fumes): 0.2 mg/m <sup>3</sup>
		OSHA TLV-TWA (fumes): 0.1 mg/m <sup>3</sup>
		Mouse, Intraperitoneal: LD <sub>50</sub> : 3.5 mg/kg
		Human, Oral: TD <sub>50</sub> : 120 µg/kg

## SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS



**Hazardous Decomposition or Byproducts:** Hazardous decomposition of nitric acid and/or copper nitrate can produce various nitrogen oxides, including nitric oxide (NO), nitrogen dioxide (NO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), as well as nitric acid mist or vapor.

**Hazardous Polymerization:** \_\_\_\_\_ Will Occur   X   Will Not Occur

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## SECTION VI. HEALTH HAZARD DATA

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**Route of Entry:**   X   Inhalation   X   Skin   X   Ingestion

**Health Hazards (Acute and Chronic): Nitric Acid:** Nitric acid may be fatal if inhaled, swallowed, or absorbed through skin. This material causes burns and is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Inhalation may be fatal as a result of spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

**Copper and Copper Nitrate:** Copper and copper nitrate may be harmful by inhalation or ingestion. These materials may cause irritation to skin, eyes, mucous membranes, and upper respiratory tract. Copper nitrate may cause burns. Short term exposure to copper dust or fumes may cause "metal fume fever," which is a transient condition characterized by fever and chills. Chronic or long term exposure may result in lung x-ray changes not associated with harmful effects.

**Signs and Symptoms of Exposure:** Irritation, difficulty breathing, burning sensation, and yellow skin discoloration can result from contact with nitric acid. Stomach pains, vomiting, diarrhea, fever, and chills are connected with exposure to copper and related compounds.

**Medical Conditions Generally Aggravated by Exposure:** Eye disorders, skin disorders, respiratory disorders, and allergies. Copper and copper nitrate also affect Wilson's disease and disorders of the kidneys, liver, and blood system.

**Listed as a Carcinogen/Potential Carcinogen:**

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	_____	<u>  X  </u>
In the International Agency for Research on Cancer (IARC) Monographs	_____	<u>  X  </u>
By the Occupational Safety and Health Administration (OSHA)	_____	<u>  X  </u>

## EMERGENCY AND FIRST AID PROCEDURES:

**Skin Contact:** Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Watch for chemical irritations and treat them accordingly. Obtain medical assistance if necessary.

**Eye Contact:** Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain medical assistance.

**Inhalation:** If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration. Obtain medical assistance if necessary.

**Ingestion:** If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. Obtain medical assistance immediately.

**Note (Nitric Acid):** Wash affected skin areas with 5 % solution of sodium bicarbonate (NaHCO<sub>3</sub>). If ingested, the risk versus the benefit of the passage of a naso-gastric tube is debatable. Activated charcoal is of no value. **DO NOT** give the exposed person bicarbonate to neutralize the material.

**TARGET ORGAN(S) OF ATTACK:** **Nitric Acid:** The skin, teeth, eyes, and upper respiratory tract  
**Copper and Copper Nitrate:** The skin, eyes, upper respiratory tract, and mucous membranes

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## SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

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**Steps to be Taken in Case Material is Released or Spilled:** Notify safety personnel of spills. Surfaces contaminated with spills should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation, or destruction.

**Waste Disposal:** Follow all federal, state, and local laws governing disposal.

**Handling and Storage:** Provide general and local explosion proof ventilation systems to maintain airborne concentrations below the TLV. Provide approved respiratory apparatus for nonroutine or emergency use. Use an approved filter and vapor respirator when the vapor or mist concentrations are high. Wear gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and washing facilities should be readily available near handling and use areas. Wash exposed skin areas several times a day with soap and warm water.

Store under normal laboratory conditions in an upright position.

**Note:** Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

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## SECTION VIII. SOURCE DATA/OTHER COMMENTS

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**Sources:** MDL Information Systems, Inc., MSDS *Copper*, September 10, 1998.  
MDL Information Systems, Inc., MSDS *Cupric Nitrate*, September 10, 1998.  
MDL Information Systems, Inc., MSDS *Nitric Acid*, March 12, 1998.  
Merck Index, 11th ed., 1989.  
The Sigma Aldrich Library of Chemical Safety Data, Ed. II, 1988.

**Disclaimer:** Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.